

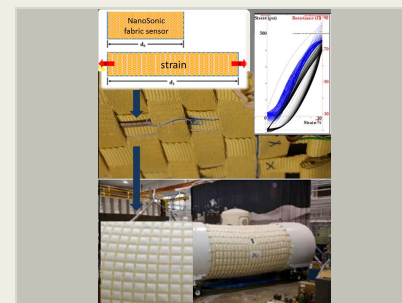
# Integrated Sensors for the Evaluation of Structural Integrity of Inflatable Habitats, Phase I

Completed Technology Project (2016 - 2017)



## Project Introduction

Future long-duration, crewed space habitat systems will be inflatable structures. This type of structure is advantageous in that it is not limited to the diameter of the launch vehicle and can therefore provide a greater volume of living and work space. Unlike conventional metal structures, however, softbody inflatables require support members to maintain their desired shapes. Despite their robustness, the webbings strain due to the internal habitat inflation pressure and resulting stress. To measure the relatively large strains that occur in the webbings during the inflation of model habitats used during the design process, pin or clip-on extensometers are used, but the pins damage the material and are unacceptable. Strain sensors directly integrated into or onto low-strain webbing fabrics like Dyneema, Vectran would allow the determination of webbing loads during the inflation process as well as during the use lifetime of the habitat. Such webbing-integrated elongation sensors would have two primary uses. First, they would be used to determine and map mechanical loads during the inflation process to insure that the habitat attains proper design form. Second, in the long-term, they would be used to monitor the gradual creep of the webbings that must be balanced by inflation forces to maintain proper figure. The purpose of the proposed program is to address this specific NASA need - to develop fabric extensometers that can be built into habitat webbings during their manufacture and used to measure loads during inflation and long-term use. To that end, NanoSonic will build on its Metal Rubber (MR) technology to create fabric sensor materials that are electrically conductive and mechanically flexible, tailored to the required performance metrics of the structural webbing materials.

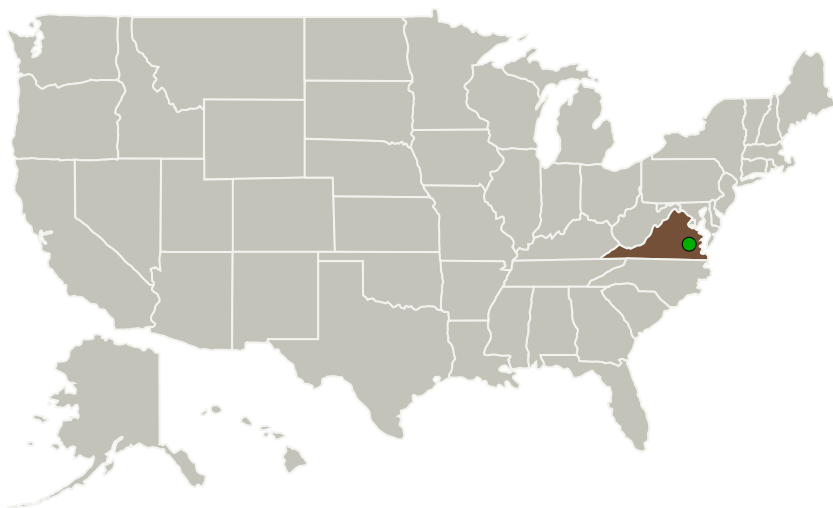


Integrated Sensors for the Evaluation of Structural Integrity of Inflatable Habitats, Phase I

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## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
Virginia Polytechnic Institute and State University(VA Tech)	Supporting Organization	Academia	Blacksburg, Virginia

## Primary U.S. Work Locations

Virginia

## Project Transitions

▶ **June 2016:** Project Start

✓ **June 2017:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139800>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Nanosonic, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

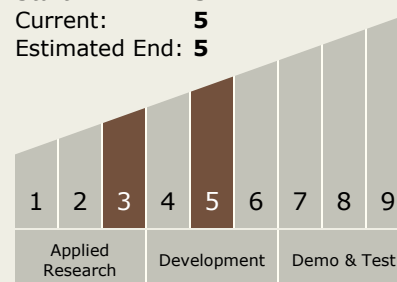
Carlos Torrez

### Principal Investigator:

Michelle Berg

## Technology Maturity (TRL)

Start: 3  
Current: 5  
Estimated End: 5

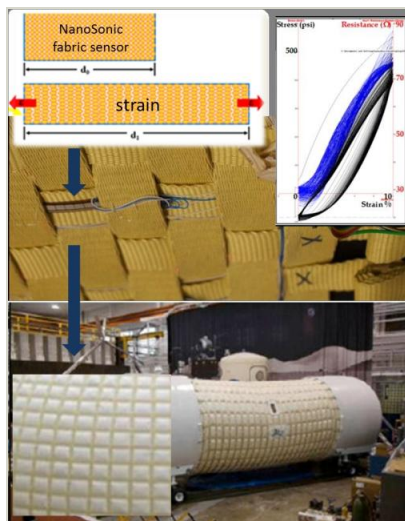


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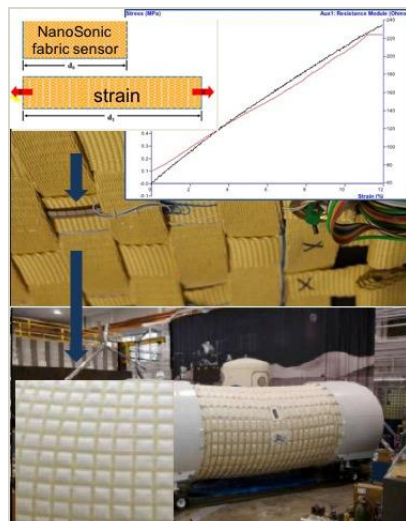


## Images



### Briefing Chart Image

Integrated Sensors for the Evaluation of Structural Integrity of Inflatable Habitats, Phase I  
(<https://techport.nasa.gov/image/127133>)



### Final Summary Chart Image

Integrated Sensors for the Evaluation of Structural Integrity of Inflatable Habitats, Phase I Project Image  
(<https://techport.nasa.gov/image/133212>)

## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.2 Structures
    - └ TX12.2.5 Innovative, Multifunctional Concepts